COLONY OF THE GAMBIA.

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THE REPORT

OF THE

DEPARTMENT OF AGRICULTURE,

FOR THE PERIOD ENDING 31ST MAY, 1935.

Price 2/-

BATHURST:
PRINTED BY THE GOVERNMENT PRINTER

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THE REPORT

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DEPARTMENT OF AGRICULTURE

FOR THE PERIOD ENDING 31ST MAY, 1935.

METEOROLOGY.

1. Except for the Upper River Province the Protectorate experienced very unfavourable weather conditions during June and early July, the main planting period. Rains were light and separated by prolonged dry spells. Crops suffered as the result, particularly towards the coast. The rain ceased rather abruptly in October. A heavy rain of 12.55 in Bathurst and 14.15 at Cape St. Mary was experienced on the 18th and 19th August.

2. Rainfall records of five stations are given below. Bathurst and Cape St. Mary (coast stations), Kerewan (over middle river), Yoroberi-kunda (middle river) and Wuli (upper river).

1934.	Bathurst.	Cape St. Mary.	Kerewan.	Yoroberi-kunda	Wuli.
June	1.53	1.04	1.69	4.64	8.36
July	9.39	6.37	9.53	5.50	11.07
August	22.76	25.22	17.79	14.94	13.78
September	9.77	8.39	12.22	6.53	11.91
October	1.37	1.19	1.21	3.02	3.49
November	.09	—	—	—	—
1935.					
January	0.66	0.80	0.70	0.11	0.03
Total :—	45.57	43.01	43.14	34.74	48.64

3. Temperatures are only available for the following stations :—

1934. Months	Bathurst. Means.		Cape St. Mary Means.		Yoroberi Kunda. Means.		Wuli. Means.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
June	87.2	71.5	83.9	66.9	94.6	72.9	94.3	75
July	88.7	74.6	86.7	68.0	91.3	70.8	90	74
August	86.7	71.4	85.9	68.5	86.0	69.1	87	75.5
September	85.9	73.3	84.2	65.7	88.3	70.3	89	77.3
October	89.7	74	88	67	94	69	92	74.7
November	87.7	68.8	85.2	63.8	93.4	65.4	95.3	67.6
December	87.3	63.1	82.0	63.9	91.6	56.4	94	56.3
1935.								
January	85.5	63.0	84.0	61.3	89.5	56.0	94	55
February	85.4	62.9	82.0	63.4	90.7	63.4	96.5	63
March	81.8	63.3	77.3	64.6	103	66.6	102	63.3
April	84.6	65.1	81.2	65.5	103	67.8	104	74.1
May	—	—	82.8	67.3	104.9	68.8	105.5	76

Locusts.

4. Very few swarms were recorded in the Protectorate and little damage was done.

Veterinary.

5. This dry season the immunisation of cattle, by a Veterinary Officer seconded from Nigeria, against rinderpest was mainly centred in MacCarthy Island Province particularly in Fulladu West.

The effect of this work near to the Agricultural Headquarters has been of value to Government by a better appreciation of the work being done by both services for the benefit of the people.

6. A few outbreaks of rinderpest occured but none of a very severe nature.

7. *Hides.* The exports of these increased but the improvement in the preparation of the hides did not continue though firms were prepared to pay a premium for such.

Seednuts.

8. The low price of the 1933 crop caused some farmers not to grow any in 1934 and others to reduce the areas. Strange farmers in addition dropped in numbers. Being followed by a good price season the smaller crop has resulted in the seednut reserve for 1935 dropping down to a fine margin and should there be a big influx of strange farmers some districts are likely to be short. Action has however been taken by Commissioners to overcome the situation.

Crops.

9. *Groundnuts.* As already mentioned the area under this crop showed a decrease. The poor rains of June and early July was reflected in the retarded growth and in some cases a failure of the early sowings. Had the rains been adequate during this period there would have been a much larger crop. Previous experiments by the Department have definitely shown the enormous advantage in yield to be derived from early sowing in an average season and results this past season show that growth was so retarded as to nearly obliterate this effect of early sowing.

10. As the harvesting of the 1933 crop in some places resulted in an increase of bad nuts, more definite action was taken during the past season to persuade the people to harvest at a later date. The advice given to leave the nuts in the ground till the rains had ceased was not received with any enthusiasm, but the people were prepared to give it a trial, and districts definitely known to have shown a high percentage of bad nuts in the past years have this season produce a good healthy average crop.

The crop generally was of high standard and it was extremely unfortunate that heavy rain in January affected some of the traders' heaps.

11. *Food Crops.* Grain crops generally suffered from the lack of rain in June and early July and in many cases resowings were necessary. "Silo" (striga sp) continues to levy a heavy toll of these crops and the people take no concerted action in its destruction. It is difficult to understand this attitude as they are well aware of the effects of these pest and one can only come to the conclusion that they object to the necessary heavy labour involved in its eradication. Unless the people do take action and soon, the question of scheduling this plant as a pest will have to be considered and authority given to order its destruction under penalty, as happens in other countries with various pests and diseases.

12. *Cassava.* Though on the increase in certain districts is capable of much further development and pigeon pea is only beginning to be noticed in most areas.

13. *Ragi.* (Elusine corocana) has so far not proved very successful in the farmers' hands chiefly through lack of cultivation.

14. *Italian Millet.* (Setaria italica). Seed of this is being offered to people who have seen it grown on the Agricultural stations and there is every reason to believe it will prove a success with the farmers, if rightly attended to. Visitors to the farm at Yoroberi-kunda were very much impressed including natives of the Senegal and Cassamance, some of whom asked for seed.

15. *Rice.* Through the kind co-operation of the Director of Agriculture, Nigeria, we were able to meet some of the demands for seed of Guiana Creole rice and it is now being grown in most rice areas. Demands for seed are still high and much of this is being met by growers themselves. The Department are also disposing of fair quantities of seed.

The way the people have taken to this rice might appear as rather amazing but it is not to be wondered at considering the very large yields as compared with native varieties.

Recent Introduction.

16. Thanks are due to the Director of Agriculture, Nigeria, for supplying two new groundnut selections, the Director of Agriculture, British Guiana for seed of a selected rice and the Director of Agriculture, Sierra Leone for seed of Kola.

Export Products.

17. *Groundnuts.* In view of the detrimental effect of an uncontrolled trade season on the quality of the crops it was decided to re-introduce opening and closing dates. The season was opened on the 20th November and, with the high prices offered and the small crop, trade practically ceased early in March and the season was closed on the 31st March. The quality of the crop was good.

18. *Beeswax.* There was a large increase in the amount of wax exported but no improvement in the quality brought in by the people.

19. To try and overcome this latter defect and to obtain some reliable data on the quality capable of being prepared by the native himself the Agricultural Department undertook the preparation of a consignment on simple lines and this was forwarded home for report. A copy of the report is attached as an appendix.

20. A further development connected with this industry was given a trial by the Department. Bee keeping is extremely primitive, wholesale slaughter is inevitable the way wax is collected and the honey extracted leaves much to be desired. A start was made by constructing a beehive locally on the Dadant pattern and a few necessary materials ordered from England for handling and Queen bee control. Unfortunately each effort has been nullified by unappreciative thieves.

It has been rather surprising that though the drone and workers are well known to the people they had never seen a queen or even considered it. Interest however was not lacking in the efforts of the Department and visits throughout the Protectorate particularly in bee keeping areas indicate the desirability of the Department continuing its work in this direction.

TABLE OF CHIEF EXPORTS.

21.	1933		1934	
	Quantity	Value £	Quantity	Value £
Groundnuts	67,370 tons	500,766	71,919 tons	387,345
Palm Kernels	615 ,,	4,199	553 ,,	2,712
Hides	21,202 lbs	185	141,511 lbs	1,978
Beeswax	11,095 ,,	272	59,826 ,,	1,404

* approximate only ; no figures available.

PRODUCE INSPECTION.

22. With three European officers available it was possible to give more attention this season to inspection, and generally speaking heaps were found clean and few rescreening orders were necessary.

GENERAL.

23. Tours were undertaken during the year and the major portion of the Protectorate was visited.

In addition to inspection of seednut reserves, the question of food crops was discussed and also the activities of the Department at their stations.

24. Several other items were points of discussion and of these the deterioration in soil fertility arose. Certain areas are thickly populated and nearly all available land under cultivation more or less continually. The effect in districts where cattle are few is bad and inquiries were made as to the utilization of village refuse. In some cases the dry refuse is thrown into gardens but in most cases a heap of rubbish can be found outside the villages, sometimes within, which is not put to any use whatever and in addition is not sanitary. The department are busy at present with the problem of disposal of this rubbish by compost heap methods which will meet with sanitary requirements and allow for agriculture the utmost benefit. This was the first time for several years that it was possible for more than one officer to undertake tours in the Protectorate and many swamps were surveyed in the South Bank Province for irrigation sites and possible extension for wet season rice.

DEPARTMENTAL ACTIVITIES.

25. Brief reports follow, covering the experimental stations at Yoroberi-kunda and Wuli and the irrigation work being conducted in the various centres.

DEPARTMENTAL STATIONS.

26. *Headquarters, Yoroberi-kunda, MacCarthy Island Province.*

The following officers were in charged during the year.

Mr. F. W. HALL, Senior Agricultural Superintendent, from 1st June, 1934, to 23rd February, 1935.

Mr. J. PIRIE, Agricultural Superintendent, from 24th February, 1935, to 31st May, 1935.

Work was continued on the capital operations of clearing, road construction and the erection of accommodation for labour. The latter two were completed and it is not expected there will be any further outlay in these directions for some years beyond upkeep.

The extention in clearing allowed of a more comprehensive programme in the field and some of this is detailed below.

27. *Groundnuts.*

It was decided in view of the results obtained from previous spacing trials to undertake a direct test of the improved methods of cultivation with closer planting against that of native practice. Through the willing co-operation of the local Seyfu and people the native methods were carried out completely by them the same way as on their own farms.

Briefly the treatments in the experiment were as follows :—

P. Ploughed with single furrow plough and sown as near 1′ x 1′ as possible without actual measurement.

H. Dug with West Indian hoe and planted as for P.

R. Ridged with the small Beauvais ridging plough and planted as near 9″ as possible on the ridges. The furrows were the only portion of the soil to be disturbed as in native practice with the darambo (native tool) Spacing worked out about 2′ x 9″.

D. Ridged with darambo giving a somewhat similar finish to R.

F. Direct sowing into cleared but uncultivated land the usual native practice with early sowings, particularly when the land is not wet enough to use the darambo. Spacing work out at about 1½′ x 1½′.

28. From this it was expected that useful information on the effect of cultivation on germination, weeding disease and yeilds would be obtained.

Each treatment was repeated 5 times in a Latin Square and each plot was 0.5 acres.

29. The rains opened with a heavy storm on the 6th June and ploughing was started the following day. It was not however until the 23rd June that conditions were favourable for treatment F to be undertaken and consequently sowing was delayed to that date. From that date to the 14th July dry and hot weather delayed sowing in the uncultivated plots and as this was a contingency to be looked for in this treatment all the other treatments within the same row were sown at the same time. The effect therefore of later sowings in the same experiment was to a great extent eliminated in the variance due to row effect.

30. Germination following this unfavourable weather was, as in the surrounding district, very poor and a rough count over measured random areas in each plot gave the following results. Seed was sown one to the hole.

	Treatment.						
% germination.	P	H	R	D	F	Mean	S. E.
Means	85	83.2	73.6	72.8	61.4	75.2	1.25

Such results were expected and the farmers realise that the tilth created by cultivation means a better germination though they do not fully realise that it is the effect of checked evaporation. The more thorough cultivation with the plough P, and hoe H gave a significantly superior effect to the other treatments.

31. Resowing was carried out as far and accurately as possible and was completed by the end of July. In August the weather became more favourable and rain fell evenly throughout the month.

Weeding became necessary in the ridged and uncultivated plots during the middle of the month and it was not till September that such attention was required in the ploughed and hoed plots. The remainder of the season up to the beginning of October continued moist and though the ground was not covered by the beginning of September no rosette appeared the weather apparently proving unfavourable to the vector. All plots under R, D & F required three weedings against two for P and H.

32. The crop was harvested in mid-October with the following results. The different treatments had no effect on harvesting, the uncultivated plots being just as early reaped as the ploughed.

lbs. per acre.	Treatment.					Mean	S. E.
	P	H	R	D	F		
Mean	1314	1226	954	1038	984	1102.8	63
%	119.1	111.1	86.5	94.1	89.2	100	5.7

Though the ploughed plots gave significantly better results than the ridged or uncultivated the difference is not so striking as one would have been led to expect from previous spacing trials. The yields in all cases were low though superior to any surrounding native farms. This experiment will be continued on a smaller scale so that planting can be carried out in a shorter time.

33. In cost of man days there was little difference between the treatments. The labour being unaccustomed to sowing as above as 1′ x 1′ took double the time to sow the ploughed and hoed plots. This extra labour was offset by a reduction in labour for weeding. The saving in labour on preparation in the uncultivated plots was more than offset by the increased weeding necessary during the season, 3.5 cattle with plough and one man were necessary to complete an acre per day.

Extra labour however was necessary to harrow to bring into condition for sowing. When the labour is more used to ploughing and sowing close it is expected that the man days saved should approach 19%.

34. *Groundnut Introduction.* Two varieties of groundnuts were obtained from Nigeria, and these were grown for increase. The varieties Sir Charles (upright) and Castle Cary (prostrate) were received early and sown in June. The former appeared very promising considering the poor season experienced. A longer season seems desirable as there were numerous pegs with half formed nuts when the dry weather set in. This variety created some interest among surrounding farmers.

35. *Sorghums.* In addition to selections from the previous season's crops several varieties of sorghum were collected from the district and grown in panicle rows.

The sorghums all come under the following species.
Sorghum margaritiferum (Native:—Kinto, Nyaro etc.)
Sorghum cernuum (Native:—Gajabo, Bambarro, Basso)
Sorghum guineense (Native:—Basso ba).

36. *Sorghum Margaritiferum.*

These are the most variable in the length of season required. All are sown at the beginning of the rains and some ripen early September while others are not ready till late October and early November.

A strain of Nyaro selected in 1934 on earliness has proved promising in this respect though further selection is necessary.

37. *Sorghum cernuum.*

Selected strains of the straight and goose necked types showed much variation and both types appeared in each selection. Further selection has been carried out.

38. *Sorghum guineense.*

This is the most variable of the guinea corns grown by the farmer, and the latter makes no effort to separate out the better strains. The work on this crop was confined to selecting out for future work as many variations as possible.

Sowing date trials were carried out with two selections of S. guineaense and indications were to the effect that later planting than the 6th of July depresses yields considerably. There was no appreciable difference in the yields between the two selections.

About 8 acres were put under guinea corn as a trap crop for Striga which was extremely bad, and approximately half this area had to be sacrificed in eradicating the striga.

Yellow cholam guinea corn was tried as a late sowing. It was sown the 3rd August and ripened shortly after cessation of rains in October. Unfortunately insect pests created a great deal of damage and the crop was only fair.

39. *Bulrush Millet.* Pennisetum spp.

Selection work was continued on all known native varieties.

This crop though grown near the guinea corn was much less attacked by striga and it was only necessary to uproot a very small area to deal with the weed.

40. *Italian Millet.* Setaria italica.

Two sowing dates were carried out with two selections of this crop on 19th and and 27th July, on land ploughed three days before. The first sowing was somewhat affected by striga spp. the later ploughing of the second apparently reducing the incidence of the weed with the result that the second sowing showed a much better growth and yield. The first sowings gave 406 lbs. per acre and the second 462 lbs. There was no significant difference between varieties.

Selections were made including a third type with a more lax though heavier head.

This is an extremely promising crop and should prove of value in meeting the necessity for short season crops.

41. *Ragi.* Eleusine corocana.

Five selections were grown under broadcast and line sowing. The former were difficult to weed and were attacked rather heavily by Striga spp.

The latter was spaced 1½″ x 6″. The broadcast yielded at the rate of 267 lbs. per acre and that sown in lines 705 lbs. The results indicate that a spacing trial is desirable.

42. *Leguminous Crops.*

Cajanus cajan (Pigeon Pea) Crotalaria juncea (Sunn Hemp) Dolichos biflorus, Dolichos lablab and Mucuna utilis were all dealt with, and of these D. Biflorus and D. lablab gave poor results as a cover.

The Mucuna did extremely well as a cover completely overcoming all weeds. The cattle also appeared to like it. The pigeon pea was tried out in light sandy soil the heavier grey soils and on the gravelly soils near a laterite outcrop. It appears to do moderately well except on the gravelly soil where growth was lighter and a tendency to die out during the dry season. All was grown for seed distribution.

The Sunn Hemp was grown for seed increase. Growth was fair averaging 5 feet.

43. *Cotton.*

Cambodia and four selections of native cotton were grown for observation and further selection. In the initial stages Cambodia was superior in growth and general health but by January there was little to choose between the types except in the quality of the lint which favoured the Cambodia. Insect pests were troublesome and many bolls affected with dry rot.

44. *Rice.*

Guiana Creole and a variety of rice from Djougoutes were grown in neighbouring swamps. The former was also grown on the irrigation area in Georgetown. The Djougoutes rice was received too late for a comprehensive trial consisting of varying depths of water.

The Guiana Creole did extremely well in Georgetown where the ground had been previously manured with groundnut grass. In the swamp near the station it was grown under the same conditions as neighbouring native rices, *i.e.* the ground unmanured, roughly dug over and the seed broadcast.

From observations, it was fairly obvious that in health, general growth and yield it was much superior to local rices. It is hoped that a larger area of land can be obtained next rains to undertake a trial for comparative yields. The yields in Georgetown varied from 3,237 lbs. paddy per acre where manured and transplanted to 2,329 lbs. paddy where unmanured and broadcast.

Near the station unmanured and broadcast the yield was 1,904 lbs. paddy per acre. Samples of neighbouring rices gave estimated yields of 874 lbs. to 1,212 lbs. paddy per acre.

45. *Miscellaneous-crops.*

A further trial was given to Soya beans. As in past trials the results were unsatisfactory. The crop is not suited to the tropical climate in the Gambia and the necessary bacteria are not in the soil. As a cash crop it cannot with present world yields and prices compare with groudnuts.

A small area was planted up with cassava for increase and stock purposes.

46. *Cattle.*

The herd was brought up to a strength of 32 during the year. Two births occured and two deaths. Others were disposed of owing to trypanosomiasis and the herd now numbers 28 of which 5 are bulls 16 bullocks, and 7 cows.

General health was good and all have been immunised against rinderpest. They were employed throughout the year on general farm operations.

47. *Ploughs.*

Several new ploughs were tried out during the year and some promising results obtained from types cheap enough to compete with any locally made tool and much more efficient. A locally made Indian type wooden plough cost the department at least 8/6 as against the all metal M.S.N. costing 6/-. This latter, also Sutlej and Hindustan were obtained from Ransomes, Sims & Jefferies and the most satisfactory results were obtained by the Sutlej, the cost of which is only 10/9. It is a most sturdy tool and probably the best for local conditions for flat cultivation. It has not been possible to obtain as yet an efficient ridging plough light enough for the local cattle.

WULI EXPERIMENTAL STATION.

48. Mr. E. Williams, Agricultural Superintendent was in charge during the period under review.

49. Weather conditions generally were normal and except for one or two tornadoes which damaged cereal crops the weather was favourable.

50. *Groundnuts.* The spacing and sowing date trial was continued. First sowings gave poor germination due to some unsatisfactory seed. In spite of this however results which are given below again indicate the desirability of early and close sowing.

A. Main Plot Treatments.

Date of Sowing.

	Sowing Date.			Mean.	S.E.
	June 15th	June 29th	July 13th		
Mean yield per plot in lbs.	102.60	56.85	61.35	73.6	1.96
Yield per acre.	2758 lbs.	1528	1649	1978	52.8
%	139.4	77.2	83.3	100	2.6

B. Sub-Plot Treatment.

Spacing

	Spacing.			Mean.	S.E.
	2' x 2'	2' x 1'	1' x 1'		
Mean yield per plot in lbs.	20.65	25.10	27.85	24.55	0.76
Yield per acre in lbs.	1666	2024	2246	1978	62.7
%	84.3	102.3	113.5	100	3.1

51. The variety trial gave no significant difference between yields. The average yields per acre were :—

Basse	2492 lbs.
Gambian	2564 „
Senegal	2419 „
Philippine White	2379 „
Conagi	2363 „

52. Many farmers in using their previous season groundnut field for grain crops generally leave all volunteer groundnuts to mature. In some cases such volunteer plants are very numerous, and a trial was conducted to see the effect of one crop on the other and if the two would result in a better return than a pure grain crop.

Guinea corn and Bulrush millet were interplanted with groundnuts and controls sown solely with the grains alone and groundnuts alone.

53. The result however shows that groundnuts interplanted between guinea corn or bulrush millet grown in rows of 3' apart is not a paying proposition.

The results on an acre basis were :—

(1)	Guinea corn alone	1791 lbs. of heads.
(2)	Guinea corn and groundnuts	1710 „ „ „ 113 groundnuts
(3)	Bulrush millet alone	1307 lbs. of heads.
(4)	Bulrush millet and groundnuts	1065 lbs. of heads. 64.5 „ „ groundnuts.
(5)	Groundnuts alone	1742.

54. It would appear that the effect of growing groundnuts between the rows of guinea corn does not depress the yield of guinea corn, but the yield of groundnuts so obtained does not compensate for the seed and trouble of growing them.

55. It would appear that the effect of growing groundnuts between the rows of bulrush millet is to slightly depress the yeild of millet and the yield of groundnuts so obtained does not compensate for the seed used and trouble of growing them.

56. *General Selections.* Forty-five types of groundnuts, being either crosses or selections, were planted out in June. Each type was grown in separate rows. Field observations were taken from time to time, and each type was carefully examined and afterwards bagged at harvest. The germination of all types was poor on account of bad seed.

After paying strict attention to

(1) Habit of growth with respect to Gambian conditions.

(2) Probable yield.

(3) Disease resistance (there was no rosette on any type).

(4) Quality.

All the Philippine white selections appeared to do well, and sufficient seed should have been obtained to grow large size plots of each type in 1935.

57. *Breeding Work.* An attempt was made to cross the Philippine pink groundnut with the Basse groundnut, with the ultimate aim of combining the high quality of the former with the yielding property of the latter.

The cross was made in both directions, and as some 6,000 flowers were cross fertilised, sufficient seed was obtained for the work to be carried on next season. However, as the groundnuts were not planted until July 24th complete success could not be expected. Observations at harvest showed that with Basse as female the effect of Philippine pink as male was to make the resulting nuts smaller than normal Basse nuts, (this may have been largely due to late planting, although the controls were quite normal), and also the testa was lighter in colour than normal.

No external difference was noticed with the reciprocal cross,—if anything the nuts resulting from Basse (male) X Philippine pink (female) are lighter in colour and somewhat smaller than the normal Philippine pink nuts.

58. *Miscellaneous.* Several varieties of groundnuts were grown for increase and observation.

Cereal Crops.

59. *Maize.* Both Native and Anveld maizes were grown. In every case growth and yields were rather poor indicating the low fertility of the land particularly in respect of this crop. Tornadoes did much damage in laying the plants. The crop also suffered severely from the depredations of birds though crop guards were in constant attention. Selections were made of desirable types.

60. *Guinea Corns.* Seveaal different varieties were grown in head to row in addition to general plots. It was found admixture was heavy. Selections were made of heads apparently true to type. "Leo" (Aphidae) and smuts affected most varieties.

61. *Nyaro.* The vegetative growth of this crop was not so good as in the case of the other sorghums, but this is probably due to lower fertility, as there was a marked tendency for the crop to become poorer as one advanced down the farm in a northerly direction. An examination of the heads just before harvest showed that the crop was markedly heterozygous as far as colour of the grains was concerned. The colour varied from black to white. All the grains were well filled; and owing to its earliness this crop largely escaped the damage done by "Leo" jankaro, (Aphidae) to the other cereal crops.

The various coloured heads were harvested separately, and selections were made for seed purposes,

62. *Millets.* Ragi (Eleusine Corocana). Three strains of Ragi, 1, 2, and 3 were grown. An area of 40′ x 261′ was allotted to each type. The planting distance was 1′ x 1′ with 2—3 seeds in each hole. Germination was good, and a good stand was obtained. There would appear to be little difference between the types from a botanical point of view. The chief differences were :—

(1) Ragi No. 1 matured one week later than Ragis Nos. 2 and 3.

(2) Difference in vegetative growth. Ragi No. 1 was taller than Ragis

Nos. 2 and 3, Ragi No. 2 tillared better. Ragi No. 2 was short in the straw, but the indications were that this was probably due to poor fertility than to any inherent difference in the type.

Yield.	Ragi No.	1.	Area	40 x 48	=	15	lbs.—	340	lbs.	per acre.
	„	„	„	40 x 213	=	111	„	567	„	„ „
	„	„	2	40 x 48	=	17	„	386	„	„ „
	„	„	„	40 x 213	=	159	„	813	„	„ „
	„	„	3	40 x 48	=	13	„	295	„	„ „
	„	„	„	40 x 213	=	95	„	418	„	„ „

One of the disadvantages of this crop is the difficulty of threshing, especially during the rains. Observations showed that it took 15 men one day *i.e.*, at a cost of 12/– to thresh out 159 lbs. of seed, or approximately 1*d.* per pound which is more than the value of the crop.

63. *Setaria.* (Setaria italica). Three strains of setari italica viz :— 936, 937 and 938 were grown. The planting distance was 1′ x 1′, with 2—3 seeds in each hole. Germination was good in all the plots. There would appear to be very little difference in the three types from a botanical point of view. Type 937 gave a strain rather lighter in colour than types 936 and 938. There was however distinct difference in vegetative growth, but this was possibly due to position rather than to any inherent difference between the types. Type 937 grew 9″—1′ taller than 936, and 18″ taller than 938. Type 938 was very short in the straw but this was probably a fertility factor, The size of heads was similar in all three

cases, although extra large heads with long awns appeared in each plot. This appears to be a separate strain and selections of this large headed type were taken for further investigation. The increased yield of 936, as compared with 937 and 938, was definitely due to increased tillaring power rather than decreased size of heads.

The crop suffered to a slight extent from the depredations of birds. Type 936 is worthy of further investigations, as it is a high yielder and gives a meal highly attractive to the native, and would be a suitable substitute for findi.
Yields, The top 48′ of each plot was harvested separately.

Setaria	936	—	1308	lbs.	per acre.
,,	937	—	434	,,	,, ,,
,,	938	—	488	,,	,, ,,

64. *Panicum miliaceum.* This crop grew to a heighn of 1′, and the indications were that the fertility of the soil did not give a real measure of the value of the crop.

The chief value of this crop lies in its earliness. It might be a useful crop to supply the immediate needs of the Africans until the maize was ready.
Yield. 108 lbs. of grain per acre.

65. *Rices.* Of the various rices grown at Wuli during 1934, few, if any, have anything to recommend them. This was probably due to the fact that most of these rices were grown on land which had carried successive rice crops, and the indications were that the soil was exhausted.

The hill paddy rice with a yield of 611 lbs. per acre was not a success, but the dry paddy rice with a yield of 665.5 lbs. per acre appeared to have been grown in a soil lacking in the essential plant nutrients and it is suggested that this crop should not be discarded on last season's result.

Of the Indian rices only Kattamodan rice with a yield of 1304 lbs. per acre, surpassed the 1000 lbs. mark although Budama with a yield of 984 lbs. per acre came very close.

All the native Gambian rices were very poor. The highest yielder was Mani Koio with a yield of 707 lbs. per acre. None of the native rices appeared attractive in any way, and with the very small area of each it was not possible to make comparison. The indications are that these rices require to be grown in definite swamps, and not on land flooded to a depth of 6′ as happened in this case.

66. *Basse Rice Plots.* The Guiana Creole Rice was a marked success, and the plots, approximately 1.36 acres, caused quite a sensation among the rice growers at Basse. The Seyfu of Fulladu East paid visits to the plots and appeared quite interested. The indications were that the sooner this type of crop is put in at the beginning of the rains the greater the crop.

Yields.

Seed bed rice plots	=	4208	lbs.	threshed	rice	per acre.
Transplanted	=	3054	,,	,,	,,	,, ,,
Broadcast	=	2127	,,	,,	,,	,, ,,

Average over whole area = 3721 lbs. of rice from 1.36 acres, or 2707 lbs. of rice per acre.

67. *Leguminous Crops.* These covered both food and cover crops.

68. *Grams.* (Phaseolus Maize.) Only fair results were obtained as regards yield. A drawback is the slow uneven ripening and tendency to shatter. From a green manure point both the green and black showed up well, up to about the middle of August.

69. *Horse Gram.* Heavy rain affected this crop and many appeared to be dying out in the middle of August. Towards the end of September with drier weather the crop recovered somewhat. It is however a quick growing cover and has only a slight effect on weeds, and generally under the conditions here much inferior to Velvet Beans.

70. *Dolichos lablab.* This crop also showed up poorly as a green manure or soiling crop as compared with velvet beans.

71. *Velvet Bean.* Growth at first was slow but a complete cover to a depth of 2 feet was obtained by the end of July. This of all the legumes appeared the most promising as either a soiling or green manure crop and will be given adequate trial in these directions.

72. *Native Bean.* Various native beans chiefly Vigna spp. were tried and results indicated that the types generally were very poor. New introductions in this respect are desirable.

73. *Pigeon Pea. (Cajanus indicus).* The pigeon peas planted in July 1933 at the Northern end of the Experimental area all died away, except for two rows bordering the farm road, during the dry season of 1934. An area of 174′ x 150′ of Gambian pigeon pea was sown in the main area in July 1934. The germination was poor and the crop had to be supplied. However a good stand was obtained, and the crop is at present in pod, and the indications are that a good crop should be obtained in February 1935.

Eight imported varieties of pigeon peas were planted in the main area in plots 20′ x 148′ each. It was soon obvious that the varieties were not pure and the plots were rogued in January with respect to :—

(1) Earliness
(2) Habit of growth.

The crop should be ready for harvesting in February but the present indications are that all the eight types are heavy yielders.

74. *Sunn Hemp.* (Crotolaria juncea). Area 200′ x 150′ hand dibbled in 1′ x 6″. Area 32′ x 98′ broadcast. The germination was good and the crop grew rapidly reaching a height of 6′ — 10′ in September. The crop began to flower at the beginning of September. On October 3rd, 1934, just when the pods were beginning to set a small area of each type was cut for purposes of retting. Thirty bundles were taken from the dibbled and 20 bundles from the broadcast plot. Each bundle contained 50 plants with the side branches lopped off. The bundles were placed in the swamp behind Wuli for 12 days *i.e.*, until the fibre readily separated from the pith. The bundles were removed from the swamp, the fibre removed from the sticks, and the fibre washed in the river until clean and then dried slowly in the sun. In this way a highly attractive whitish coloured fibre was obtained. Some samples of rope were made from the fibre. Sunn hemp as a fibre crop is worthy of further investigation in the Gambia, and it is a crop highly suitable for present cultivation and has an export as well as a local market. The remainder of the experiment was seeded.

75. *Cotton.* (Gossypium spp.) The cotton grown at Wuli in the growing season of 1934, consisted of 5 types:— Cambodia, and four native selections. A plot 40′ x 228′ was allotted to each type.

1.	Cambodia	Planted	17th July, 1934.
2.	Native No. 1.		14th July, 1934.
3.	„ „ 2.		14th July, 1934. Planted 4′ x 1′ and later thinned out to 4′ x 2′.
4.	Native No. 3.		16th July, 1934.
5.	„ „ 4.		16th July, 1934.

The germination was only fair and the plots were supplied. All through the growing period the Cambodia cotton appeared to be more healthy than the native cottons but there was little to choose between the native selections. When the plants reached maturity the Cambodia cotton was twice the size of the native cottons, and this increase in vegetable growth was reflected in the size and healthiness of the bolls. All the native cottons, and to a much less degree the Cambodia cotton suffered from a drying up of the plants and leaf curl. The superiority of Cambodia in this direction is probably due to its Jassid resisting properties. The leaf curl among the native cottons suggested Jassid attack. All types of cottons suffered severely from tornadoes during August and September. Cambodia cotton on account of its size suffered more from storms than the native cottons. It is important to note that taken all over the Cambodia was more healthy generally than any of the native types. The cotton suffered from the following pests:— (it was necessary to keep two labourers continually employed hand picking the cut worms and boll-worms).

(1) American boll worm—Heliothis obsoleta

(2) Egyptian cotton worm—Prodenia litura

(3) Cotton Jassid —Chlorita facialis, on native cottons only.

It is interesting to note that whereas cotton stainers (Dysdercus spp.) were observed damaging the cooses in large numbers, they were not noticed on the cotton. Harvesting of all types began on 8th December, 1934, is still proceeding (10th January, 1935) and is not likely to be finished for another month at least. Selection for uniformity of ripening is indicated, although from the Africans' point of view this is not so important.

Cambodia cotton (Gossypium hirsutum) appears to be more of the sympodial type, and the native selections more of the monopodial type.

Observation at time of picking showed that the Cambodia cotton had much larger bolls and as a result gave more lint per boll and this should be reflected in the final yield. The quality of the lint appeared to be good.

Rough field observations showed that Cambodia cotton had an approximate staple length of $\frac{7}{8}'' - 1\frac{1}{8}''$, whereas the native cottons would probably come in the under $\frac{7}{8}''$ group.

A rogue was noticed in native No. 4 plot which in size of plant was equal to Cambodia cotton, but the shape of the leaves showed that it was not Cambodia. The seed cotton from the single plant was harvested seperately. The lint length was longer than in the case of the native cotton.

IRRIGATION.

76. *Upper River Province.* This year at Basse it was possible to have an European stationed throughout the season and the results were reflected in a very satisfactory crop of rice being obtained. It would appear that the failure of the previous season was due to erratic and inadequate watering.

77. The crop was sown on the 7th November, 1934, transplanted in January and harvested in May.

78. *MacCarthy Island Province.* Owing to the satisfactorily results obtained in the past from the small area at Georgetown it was decided to extend operations to cover a wider field. This was not possible at Georgetown where the heavy nature of the ground limited operations to rice cultivation.

79. A suitable area was found on the mainland more accessible from Head-quarters and constructional operations are being carried out.

80. A slightly undulating area of approximately 3 acres has been bunded and channels and shadoofs constructed. In addition to meeting our dry season require-

ments it is expected to be able to demonstrate that the constructional work carried out will also have a wet season value in bringing under cultivation an area that is at present neglected during the rains owing to uncertainty of producing satisfactorily rice crops, the controlling factor being the rainfall. In seasons of inadequate rainfall it will be possible to demonstrate the value of the shadoof in supplementing the rainfall.

81. *North Bank Province.* Owing to the fact that there were only two European officers available and one steamer a month it was impossible to visit Doniajoe during the rains. This was unfortunate and the result was that several necessary early sowings were not carried out. Doniajoe being near the coast where the nights are very cold it is essential to have the rice at a reasonably advanced stage of growth and transplanted before the cold period sets in. After germination, paddy sown in November showed practically no growth for a period of 6 weeks, owing to the cold weather, but had reached the flowering stage in mid-April with prospects of a fair, though late, crop. This indicates the desirability of a much earlier sowing near the coast.

STAFF.

82. The following are the principal staff changes and movements during the year.

Mr. F. W. Hall, Senior Agricultural Superintendent proceed on leave on the 23rd May, 1935.

Mr. J. Pirie, Agricultural Superintendent returned from leave on the 26th October, 1934.

Messrs. J. Touray and S. Dibba were appointed Agricultural Overseers on probation on the 1st January, 1935.

A new grade of Agricultural Assistants was approved for 1935 and four appointments made.

F. W. HALL,
Senior Agricultural Superintendent.

May, 1935.

APPENDIX TO ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, COLONY OF THE GAMBIA.

REPORT FROM THE IMPERIAL INSTITUTE ON GAMBIAN BEESWAX.

Results of Examination.

The sample consisted of a block of golden-brown beeswax, measuring 27 x 14 x 9 inches and weighing 113½ lbs. There was a very slight amount of dirt in the bottom layer but otherwise the wax was in good clean condition. The material was examined with the following results, which are shewn in comparison with those obtained from a sample forwarded to the Imperial Institute by the Gambia Department of Agriculture in 1929 (Imperial Institute report dated 28th March 1930) :—

(1) The following results were obtained with the wax as received :—

	Present Sample.	Previous Sample.
Loss at 105°C	0.1%	—
Ash	0.04%	0.06%
Matter soluble in boiling water	0.3%	0.12%
Dirt	0.2%	0.10%

(2) After filtration through paper, the wax was found to have the following constants:—

	Present Sample.	Previous Sample.
Specific Gravity at 15/15°C	0.9651	0.966
Melting Point (by open tube method)	64.0	65.0
Refractive Index at 40°D	1.4551	—
Acid Value (a)	17.2	19.2
Saponification Value (b)	96.0	97.3
Esther Value (b — a)	78.8	78.1
Ratio Number, $\frac{b-a}{a}$	4.6	4.07
Iodine Value (Wija, 3 hrs.)	10.5	10.7
Hydrocarbons per cent		
Salamon and Seaber's test	58.6°C	59.5°C

(3) The following tests were also carried out on the filtered wax in order to determine the presence or otherwise of certain specific impurities :—

Test.	Result.
Weinurm's test for the presence of parraffin wax and ceresin	Negative result.
Test for the presence of stearic acid.	do.
British Pharmocopoeia method for the detection of the presence of fats, Japan wax, fatty acids and resin	do.

Remarks.

The results of the examination shew that the present sample consists of clean unadulterated beeswax of normal composition and closely resembles the sample from the Gambia examined at the Imperial Institute in 1930, which was regarded in the trade as quite suitable for the Market.